Case Studies: Pericardial effusion and fat pad

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No Disclosures

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Pericardial layers and fat

- Epicardium (outer layer)
- Myocardium (middle layer)
- Endocardium (inner layer)

Epicardial fat

Parietal Pericardium

Pericardial fat

Endocardium

Coronary blood vessel

Massachusetts General Hospital
Heart Center

Harvard Medical School
Pericardial pericardium and fat

Tamponade is a clinical diagnosis
Tamponade: Pericardial pressure >>
Right heart chamber pressure

Right atrial inversion (collapse)

- RA inversion occurs in late diastole and into systole
- Sensitivity > Specificity
  - Duration of RA inversion lasting > 1/3 of the cardiac cycle seems to improve specificity; (specificity of 100% and sensitivity of 94% for clinical tamponade in one series).
Right ventricular diastolic inversion

Apical 4 Chamber Subcostal
RV diastolic inversion

- Timing of RV Diastolic Inversion can occur briefly (typically early diastole) or throughout diastole

- RV diastolic inversion: specificity (85 to 100%) > sensitivity (60-80%)

- RV (and RA) inversion may be masked in presence of elevated right-sided pressures (pulmonary hypertension); decreased RV compliance (RV hypertrophy)

### Respirophasic Doppler Changes

**Inspiratory Change:** Inspiratory Velocity – Expiratory Velocity

**Expiratory Velocity**

<table>
<thead>
<tr>
<th></th>
<th>Pandian(^{91})</th>
<th>Leeman(^{93})</th>
<th>Appleton(^{94})</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitral</td>
<td>-10</td>
<td>-8</td>
<td>-4</td>
</tr>
<tr>
<td>Tricuspid</td>
<td>17</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>Aortic</td>
<td>-3</td>
<td>-3</td>
<td>-4</td>
</tr>
<tr>
<td>Pulmonic</td>
<td>9</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Effusion</td>
<td>-12</td>
<td>-3</td>
<td>-5 (^{\dagger}) - 31 (^{\dagger})</td>
</tr>
<tr>
<td>Mitral</td>
<td>17</td>
<td>21</td>
<td>32 (^{\dagger}) 74 (^{\dagger})</td>
</tr>
<tr>
<td>Tricuspid</td>
<td>-7</td>
<td>-7</td>
<td>-17</td>
</tr>
<tr>
<td>Aortic</td>
<td>11</td>
<td>49</td>
<td></td>
</tr>
<tr>
<td>Pulmonic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tamponade</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mitral</td>
<td>-42</td>
<td>-35</td>
<td>E - 43 \pm 9%; A - 26 \pm 12%</td>
</tr>
<tr>
<td>Tricuspid</td>
<td>117</td>
<td>80</td>
<td>E 85 \pm 53%; A 58 \pm 25%</td>
</tr>
<tr>
<td>Aortic</td>
<td>-35</td>
<td>-26</td>
<td></td>
</tr>
<tr>
<td>Pulmonic</td>
<td>86</td>
<td>40 \pm 25%</td>
<td></td>
</tr>
<tr>
<td>Left ventricle isovolumic relaxation time</td>
<td>-</td>
<td>E 85 \pm 14%</td>
<td></td>
</tr>
<tr>
<td>Left ventricular ejection time</td>
<td>-</td>
<td>-21 \pm 3%</td>
<td></td>
</tr>
</tbody>
</table>

Table from Principles of Echocardiography; 1992; Weyman AE.
Guidelines

• 1) exp-insp/exp as way to do calculation for MV and TV respiratory variation
• 2) Tamponade: MV > 30%, TV > 60%
• 3) Constriction: MV > 25%, TV >40%

• Significant respiratory variability of the mitral and tricuspid inflows should not be used as a stand-alone criteria for cardiac tamponade without concomitant presence of chamber collapse, IVC dilatation or abnormal hepatic venous flows (blunting or reversal or diastolic flow in expiration).

Doppler Findings

Aortic Outflow (30%)  Mitral Outflow (40%)
Doppler Findings

Tricuspid Inflow (80%)

Pericardial pressure depends on compliance of pericardium as well as volume of effusion
LA Collapse

- LA Collapse (specific sign but not sensitive; present in 25% of cases)

Swinging Heart
IVC Plethora

- **Inferior vena cava plethora**: Dilated with blunted (<50%) respirophasic changes in diameter
  - Sensitivity: 97%
  - Specificity: 40%.

Post-operative Tamponade

POD #1 from CABG.....
Cardiac Tamponade
post-operative hematoma

Hematoma compressing right atrium causing tamponade
Cardiac Tamponade
post-operative hematoma